

## **AN ANALYSIS BETWEEN KHULNA OLD AND NEW RAILWAY STATION CONSIDERING FUNCTIONALITY AND TECHNOLOGICAL MEASURES**

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### **ABSTRACT**

Khulna Railway Station (KRS) is one of the oldest stations in Bangladesh, which was established as a node during 1882-84 under the British government. Since then, besides the water-based communication, this railway has functioned as the most efficient means of transportation to connect the southern part with other regions of Bangladesh. Fewer service facilities, location in terms of Transit-Oriented Development (TOD), and structural condition questioned the functionality of the Khulna old railway station. To this end, a station has been designed/proposed adjacent to Upper Jashore Road, which is still lacking to adopt technical advancement. The future growth of the Khulna city will be directed by the ongoing mega projects, namely Padma Bridge, Khulna-Mongla railway project, and Rampal Power Plan. For urban sustainability, the mobility and transport systems play a significant role and enhancing urban and metropolitan living. In addition, railway networks are highly valued in planning for urban regeneration. The study aims are to discuss the relocation factors of Khulna Railway Station, and a detailed comparison has been developed between old and new stations from functional and technical dimensions. The qualitative study used different methods to collect primary and secondary data. Literature from authentic sources, such as Google Scholar and PubMed, has been used for desk-based data. Questionnaire surveys of the commuters, discussion with the expert, photographs, and traditional measuring methods were applied for the field data. The new station facilitates the commuters with required services for quick and safe traveling and promotes urban living. The new construction could be an ideal reference and direct the future planning of the public structure of the city. The study's findings will assist the authority in revising the scope of the new station and upgrading the services by integrating modern technologies. Finally, the study ended with mentioning the scope of further research on the present railway station about the method of TOD.

**Keywords:** *Khulna Railway Station, Station facilities, Transit-Oriented Development, Railway Bangladesh*

## **1. INTRODUCTION**

The railway transportation system is an old method of transportation, but in the 20th century, it faced negligence due to the road and air transport (Givoni, 2007). From a sustainable perspective, the transportation method is gaining popularity due to its cost-efficiency, environment-friendly nature, and High-speed mobility. In the era of environmental crisis, this mobility and transportation system plays a significant role in achieving urban sustainability and ensuring a liveable environment. In Bangladesh, the first railway station was built in the British period as part of regional connectivity. It was considered to be efficient for passenger or goods transportation. Over time, the transportation system has proven to be unable to adapt to new technological advancements and changing needs. The railway in Bangladesh has collapsed due to mismanagement at the service level, such as late arrival and departure, mechanical issues, ticketing corruption, and fewer facilities for the passengers. From this perspective, to improve functionality and capacity building programs, the Bangladesh government has taken initiatives to redevelop 26 railway stations of the country by prime minister funding. The Khulna Railway Station (KRS) is one of them that received funds for redesigning and reconstruction of the old station.

Khulna Railway Station was established during the British era near the 6th ghat, which was used to transport agricultural and commercial goods from east to west Bengal. Subsequently, the station activity opened for people's movement. Since then, the station has continued to function with those services that are inadequate to meet the urban needs. With time many station elements became outnumbered, the structure and materials have also started to erode. Government approved a comprehensive plan in 2014 regarding building a modern railway station for the city inhabitants. Rather than renovation or remodelling, a new proposal was developed to construct a new station. Following the methods of Transit-oriented development (TOD), a new site select adjacent to Upper Jashore Road, and near the Powerhouse More for the construction of new railway station. In 2015 the construction began, which ended in the March of 2018 with the inauguration by the Prime Minister.

In modern times, the stations have adopted technical features, such as auto controlling entry-exit, luggage checking with scanning, and auto ticketing process to maximize user-friendly services. The new station of Khulna has analyzed the needs of people and is included in the master and detail plan. Yet, the orthodox security system and ticketing are applying. This study has critically discussed the related factors influencing the relocation of KRS and made an elaborate comparison between the old and new railway stations in terms of user facility and functionality. Finally, the study highlighted the issues that need to address in future research.

## **2. METHODOLOGY**

The comparative study took the qualitative stance to analyse the functional and technical aspects of the old and new Khulna Railway Station (KRS). This approach broadens the scope for an in-depth understanding of factors related to the study issue from different perspectives. Detail data collection is the core for this study which has been done in two stages. Firstly, the published literature regarding KRS and its significance in respecting the context was collected from various authentic websites and reviewed carefully. Field data was evident as the most important due to the lack of online resources on KRS. In the second stage, various methods have been applied to collect field data, such as mapping, discussion with the passenger, key person opinion of the professional expert, and taking photographs as part of visual research method. Traditional measuring technique was applied for taking detailed dimensions of the platform height, width, and others. Discussion with commuters and key experts further clarifies the related facts responsible for the relocation of the KRS. The content analysis was used to categorize and illustrate the data gathered from the literature and the field. Discussions with commuters and key people have been given lots of information from different dimensions and thematic processes followed to organize these.

## **3. BACKGROUND OF KHULNA RAILWAYS STATION**

In 1882-1884 the Bengal Central Railway Company constructed the Benapole-Khulna Broad Gauge railway line that connected West Bengal and the East region. Along with water communication, the railway became popularized for efficiency and cost-effectiveness. After independence, the railway company was renamed Bangladesh Railway in 1972.

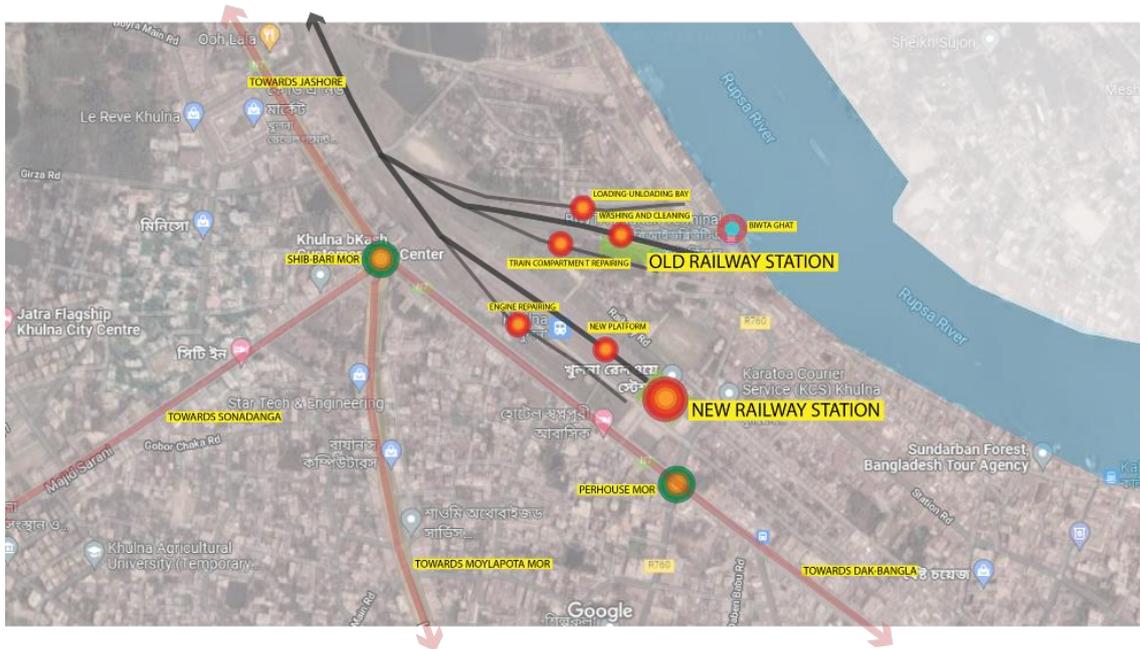


Figure 1: The location of Khulna Railway Station and the connectivity with surrounding nodes.

Based on geographical location, the Khulna has developed as an elongated city at the bank of the Rupsha River, which further extended towards the Westside. The economy, culture, and city life are generated from river-based water communication, and the economic growth relied mostly on these activities. Subsequently, the establishment of the Khulna Railway enhances value to economic-related activities and makes it the centre of commerce for the region. The river-centric market, Boro Bazar, is the commercial core dealing with wholesale and retail for this region. The map shows, the railway station and associated services are located at the heart of the city and near the vibrant nodes Shibari, Powerhouse more, Ferry ghat, and Dakbangla. The station is connected to the city's main artery, Upper Jashore Road, which ensures connectivity to other significant nodes such as the Sonadanga bus terminal, Moylapota, and Royal more. Figure 1 depicts the location of the new Khulna Railway Station and the surrounding nodes.

#### 4. FINDING AND ANALYSIS

The finding and analysis section has been divided into three parts. The first phase described factors related to the relocation of a Railway Station (RS), the second section depicted a functional comparison of the old and new RS, and the third phase concluded by describing technical aspects.

##### 4.1 Factors of relocation of Railway Station

The strategic location of Khulna Railway Station (KRS) makes it unique from a functional perspective. The BIWTA (Bangladesh Inland Water Transport Authority) ghat and the earlier bus terminal (mainly regional) operated from the Ferry ghat node have transformed the area into a transportation hub that efficiently serves the city's residents. Subsequently, the bus facilities shifted to the Sonadanga area to avoid congestion and unwanted accidents. The field survey has been identified significant insights that actively influence the relocation to adjacent the old station. The factors are illustrated below:

##### 4.1.1 Development of wholesale market and traffic congestion

During the early 1990, the development of wholesale marketplace of seasonal food items adjacent to the Sher-E-Bangla road, the approach road to Khulna Railway Station (KRS) from Upper Jashore Road,

introduced some challenges related to the everyday movement of people and commuters. For better communication with access roads and loading-unloading of products, many business people convert the roadside shops into selling seasonal items. The adjacent frontage of the shop is used for parking, loading-unloading, and displaying purposes. For doing this, a portion of the road is occupied by business-related activities (Figure 2). During peak time, when the products come from various areas the roadside becomes more crowded from morning till late night. Figure 2 shows, the workers initially keep the products on the road for primary sorting. More than half a portion of the road is utilized for these activities. The remaining road is not adequate for the free movement of local vehicles, such as rickshaws, vans, auto, and cars. As a result, traffic congestion is common, particularly from Power House More to BIWTA ghat.



Figure 2: (1) Peeling off plaster from the roof of the old railway station, (2) Goods loading-unloading activities on the road, (3) A portion of the road is occupied for goods displaying, (4) Present platform height of new railway station after further uplifting.

The sufferings increased when the train arrived or left the station. The local vehicles are waiting for the passengers, and the traffic congestion is generated in the entire road. It takes 30-45 minutes to travel a 400-450 meter road using local vehicles, such as rickshaws or auto. From focus group discussions, people mentioned many times the passengers survived to reach the station at the scheduled time due to traffic congestion and missed the train. The distance is not prolonged; however, the roadside parking and business activities leave a narrow channel for local movement, which is insufficient. During the weekend, the sufferings increased a lot because of the numbers of unloading trucks and market-centric activities.

#### 4.1.2 Inadequate in-house and service facilities

In the last two decades, the increased number of road accidents, continuous traffic congestion, and less security on the highway have influenced people to choose alternative transportation, particularly for long-traveling. Large numbers of people started to travel in railway, which previously lost the appeal for the mismanagement and service quality. Since the establishment of the railway industry in Bangladesh, this transportation has been considered the most efficient in terms of connectivity. Khulna Railway Station (KRS) was established to serve the city dwellers with adequate in-house and public facilities. Residential areas for staff, railway carriage services, and office facilities were designed according to requirement, including sitting, waiting, shops, and other services for the passengers.

Over time, the city population is growing but, the railway station was running without extending the services required for its increased passengers. Table 1 shows the list of trains that leaves and arrives at the station. More than 50 years later, the Khulna-Kolkata train connection has started in 2017 that reinforced the station activities. In-house office facilities are not adequate, including the number of ticket counters. The aged person, female, and children suffer due to lack of resting place, sitting, and

toilet facilities. People needed to wait on the open platform while train delays. Existing waiting is adjacent to the ticket counter, which is insufficient in respecting the present needs. There are no sitting or resting areas available for physically challenged people. Moreover, during the time, such as Eid day, Public holiday, Puja, etc., the situation becomes critical for the pressure of passengers.

Table 1: List of passenger trains arrive and leave from the Khulna railway station.

Intercity Trains			
Train no	Name (Up/Down)	From (To)	To (From)
715	Kapotaksha Express	Khulna	Rajshahi
725	Sundarban Express	Khulna	Dhaka
727	Rupsha Express	Khulna	Chilahati
747	Simanta Express	Khulna	Chilahati
761	Sagordari Express	Khulna	Rajshahi
763	Chitra Express	Khulna	Dhaka
3130	Bandhan Express	Khulna	Kolkata
Mail trains			
15	Mohananda Express	Khulna	Chapainawabgonj
23	Rocket Express	Khulna	Parbatipur
25	Nokshikantha Express	Khulna	Goaland Ghat
53	Benapol Commuter	Khulna	Benapol
95	Khulna Commuter	Khulna	Benapol

#### 4.1.3 Structural condition of the infrastructure

Peddlers The railway buildings around the station were designed and constructed under the British era. Traditional construction methods were applied, which included local building materials, MS bars, and sheets. According to Bangladesh's Public Works Department (PWD), the building life has already exceeded the construction lifetime. Most of them are survived in support of regular repairing and continuous maintenances. Discussion with officials found the inner conditions of the office were risky to continue works that needed urgent remodelling or relocation elsewhere. Even they did not operate all necessary activities within these limited spatial facilities. Observations of the old station explored cracks at beam and roof level (Figure 1). The security grills, door, and window were also in dilapidated condition. According to commuters, the waiting area, toilet, and resting places are in bad condition for waiting or any other purposes. The plaster is peeling off the wall and roof, and the toilet fittings are damaged. Most people suggested major redevelopment or reconstruction, while some proposed relocation.

#### 4.1.4 Less security and surveillance

Adjacent to the station area, various types of goods loading-unloading, wholesale market and BIWTA ghat-related activities are performed simultaneously from morning tonight. These make the area vibrant, but at the same time, increase the insecurity of commuters. Discussion and the physical survey found many destitute people live at the open place around the station, and the majority were involved with taking drugs and incivility that made the area insecure. Additionally, lack of lighting facilities and absence of surveillance person increase the fear of facing robbing or violence from evening to late night. The distance from the Upper Jashore road makes it isolated, and surrounding business activities affect the quality of the public environment, where people can move freely and enjoy their waiting.

### 4.2 Comparison from functional dimension

The functions of the RS broadly classified into two categories, in-house office and service areas and commuter amenities.

#### 4.2.1 In-house office and services

There have some departments required to run the station activities efficiently. In the old station, the office areas were designed for a limited number of commuters, which is insufficient for the current flow

of passengers. According to discussions with officials, the staffs do not have enough common area, and the officers' rooms are unsafe for routine work.

Considering all issues regarding of office space requirements and spatial quality the new station has designed based on the needs including modern facilities. The newly designed office area addresses proper lighting and ventilation, security and mechanical control if needed.

#### 4.2.2 Ticketing, waiting and services

A booking of ticket counter is where passengers can purchase the ticket for traveling or get all necessary information related to the schedule of the train. In the last decade, the ticketing facilities found it inefficient and problematic to manage the rush during holidays or national vacations for the passenger flow. Passengers needed to wait in line, and only three counters provided the ticket that required a long time to maintain the pressure. Even, there is no dedicated counter for female or physically challenged people. The mismanagement increases the further suffering for the commuters. Subsequently, the ticketing system was done partially automated by Bangladesh Government with a dedicated website and apps, but the technical issues brought forth further challenges. For avoiding all sufferings total of six counters with adequate sound systems have been included in the new design. Male and female follow the separate line with proper management and clean environment. The waiting area is in front of the ticket counter with toilet facilities. A separate lounge has been designed with an attached toilet and air-conditioning system. Moreover, a well-maintained drinking water facility is installed near the waiting area. Previously, passengers needed to wait in a shabby environment with unclean toilet facilities. Most of the time, people used to occupy the sittings for various purposes, such as resting or sleeping.

#### 4.2.3 Parking and shop facilities

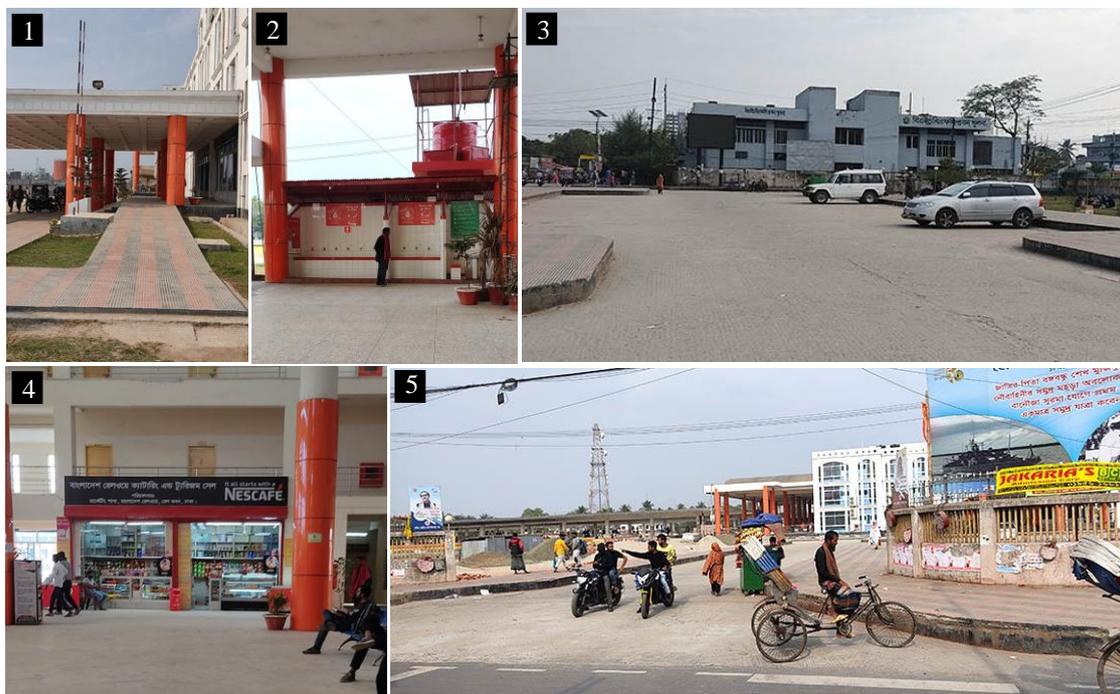


Figure 3: (1) Ramp designed at the pedestrian level for physically challenged people, (2,3) provision of drinking water and parking facilities at the new railway station, (4) Retail shops added in the waiting of the station area, (5) Entry of new railway station from the Upper Jashore Road.

The local vehicular waiting and parking facilities are prerequisites for any public station. It not only maintains traffic flow management and reduces congestion, but it also makes traveling easier. According to the physical survey, there was ample space in front of the former railway station for parking and traffic flow regulation. But mismanagement, informal use, and uncleanness make the situation complex when any train arrives or leaves the station. In the last decade, the number of private

and local vehicles, such as auto and rickshaws, has been increasing based on population, which creates a chaotic environment in front of the old station area. In the new station, the separate entry and exit and dedicated parking space for local and private vehicles maximize the efficiency of vehicular circulation. The vehicular and pedestrian entrances are designed from Upper Jashore Road, which goes out from Station Road (Figure 3). Moreover, the walkway integrated with the vehicular road with a proper ramp for physically challenged people.

Small shops and restaurant facilities adjacent to or within the station enhance the public life and quality of services. Two to three shops were informally placed on the platform in the old railway station that generated problems to frequent movement of the passengers. In the new design, defined zoning was provided for two grocery shops adjacent to the waiting area (Figure 3).

#### 4.2.4 Accommodation and public areas

In the modern station, the functions are designed according to context needs that make every hub is unique in terms of facilities, spatial quality, and visual aesthetic. Accommodation and public spaces appear as an inseparable part of any transportation hub or railway station. Khulna is best known for the historical places, such as Mangrove forest, Khan-Jahan-Ali Mosque, and other structures, and is considered the industrial and commercial hub in the South region. Many people travel for tourist and business purposes, and they need good accommodation facilities. Previously there had no lodging spaces for the passengers. After analyzing the needs, a few rooms have been designed within the station building that reduces further suffering of passengers.

Moreover, the limited public place within the city pushes people to transform the alternative public areas into urban spaces for spending quality time with family. The physical survey evidence, during early morning, many people come from surrounding residential areas for walking and in the afternoon with the family person. According to the users, the present station is well-maintained, spacious, and secure to spend valuable time with family and friends.

### 4.3 Illustration from technical dimension

#### 4.3.1 Platform

The platform is the most vital element of a railway station from where the passengers are distributed towards the destination. A suitable platform with required design considerations and components, such as paving, width, and height according to train, is controlled for the commuter movement. In designing the platform in the new station, the bay and island patterns have been followed (Wikipedia, 2021). In the old railway station, steel and concrete were used in the platform and the shade construction, which is not sustainable in the climate of Khulna. In the new station, concrete has been used as construction material.

Table 2: Comparison of the old and new railway platform.

Category	Old Rail station	New Rail station	
		Before renovation	After renovation
Platform height	0.38m above from the ground level	1.016m above from ground level	0.76m added further from platform top
		9.14m	
Platform width	8.53m	9.14m	
Height of platform top to shade	4.52m from the platform top	3.95m from the platform top	3.23m from the platform top
		9.14m	

In Bangladesh, the average height of the train from the ground is 4'-5'. Most stations have a noticeable height differential between the train coach and the platform. In the old rail station in Khulna, the platform height is too low, and numerous accidents occur as people board the train. Commonly, aged people, females, and children suffer most, and for physically challenged people to travel by train is impossible. To address the issue, the platform was made higher in the new design but did not satisfy the requirement. People still face difficulties while carrying luggage and goods. Based on the level of

the train coach, the authority has implemented a project to raise the platform height. In that case, the height between platform and roof reduces, which needs to consider in the future. Table 2 shows the details of the station platform of old and new stations.

#### 4.3.2 Operation and maintenance

An integrated service corridor is required to run the station function smoothly. The operation and maintenance are mainly run by five major departments. Every division has its responsibility to ensure functional efficiency. Table 3 shows the details.

Table 3: Detail responsibilities of each department of the Railway Station.

Department	Functions
Civil	The civil department in the station is mainly responsible for the construction of rail lines, bridges, platforms, station structures, and maintenance of these.
Mechanical	The operation and maintenance of the coach, boggy, engine, etc., fall under the mechanical department. After reaching, the train coaches are moved to the wash pit located in the old railway station. It is then cleaned and checked for any faults. The engine is moved to the loco shed that located left side of the main station area.
Electrical	They are in charge of lighting, fan, ac etc of the station and the coach.
Traffic	The department mainly controls the traffic flow of the rail. This department has many wings, and all the crossing, interchange, control of flow from the inside of the vehicle, and central controlling is done by this department.
Signal	This department controls the signalling during the train operation or maintenance period.

Additionally, the location of maintenance area regarding of rail station is vital. Previously, the center location of the old station was isolated from service zones, such as refueling and engine maintenance, washing, and cleaning of a train coach. The train coach repairing was situated near the station. The new station is located at the center from where every service can avail within shortage possible of time. Figure 3 shows, the fuelling and engine maintenance is adjacent to the No.1 platform, and washing-cleaning and train coach repairing is at the northern portion.

## 5. DISCUSSION

### 5.1 Railway station as node and place

The railway station is a node for many transportation systems; however, in recent years, the concept is expanded, and the place plays a role in urban regeneration from economic, social, and cultural dimensions. The strategic location works to grow the station as a hub for the city. Water-based economic activities can be reinforced by the comprehensive planning and utilization of railway services. Already, a loading-unloading area uses for goods transportation in the Northern part, but the function needs to redevelop with modern facilities. Additionally, roadside economic activities should be strictly monitored to reduce unnecessary traffic congestion.

In modern days, the station or terminal is considered the communal place of the society, where different public activities occur along with the functionality. Community engagement is ensured through designing the needs of society. Particularly in Khulna, lack of public places and absence of amenities compel city people to involve in other public functions. In this respect, the Khulna Railway Station (KRS) is considering a place where city dwellers can spend quality time for its openness, security, and quality environment. The addition of food facilities and sittings could reinforce public participation.

### 5.2 Urban integration of Khulna railway station in the mode of TOD

Urban integration is also a part of the importance of railway stations in urban development. One of the concerns of urban integration is the role of railway stations in urban centrality. (Conticelli, E.,2011)

That means the station should become a part of the city through its built environment. The new design of the Khulna railway station has those modern aspects to be called an urban precedent. The triple-height structure and the combination of lighting and air give people contentment. The current position of the Khulna railway station is also very near the central part of the city, which is a prerequisite factor for transit-oriented development (Park, 2018). This centrality stimulates the construction of tourist-based developments, such as accommodation, restaurants, and retail businesses. The station building design is a modern concept that will work as a reference to the further development of the city's structure.

## **6. CONCLUSION**

In the context of rapid urbanization and population explosion, the establishment of well-maintained public transport networks is required to ensure accessibility and reduction of traffic congestion and air pollution. Efficient transport networks not only contribute to urban sustainability but also urban renewal and regeneration. The old Khulna railway station served efficiently with services, although the functional deficiency, surrounding business-related activities, and lack of amenities were unable to meet the urban development and pushed authority to conceptual a new station in a different location. From the functional dimension, the new station has improved the facilities by including the maximum needs of the commuters, which is still incomplete from the modernization dimension. The new station has many improved facilities but is still incomplete. The old station is still in use for some fundamental tasks like washing and cleaning of the train coach as the new station doesn't have a wash pit yet. Many functional offices, railway thana, remain in the old station area. The integration with these existing facilities could be done through proper connectivity. The inclusion of designed open spaces in front of the new railway station enhances urban living. Technical aspects regarding platform height, operation, and maintenance is addressed in the new design.

The design of new station has improved the user facility and redesigned many functional elements, which have improved the station quality to a greater extent. Though, there is yet some recommendation for the station to be fully modern. While the parking area has improved a lot, there is not anything implemented in pedestrian vehicular interference. (Cheng, 2019) It is time to absorb a fully automated system in ticketing and other services, like a platform door opening, central control system, interlocking system, etc., which will save manpower and will be more efficient. In addition, a comprehensive plan should take to revitalize the old Khulna railway station, which is historically significant and carries the tradition of the 3rd largest city.

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